

What is claimed is:

- [c1] 1. An open magnetic resonance imaging (MRI) device, comprising:
at least one main coil for generating a magnetic field for imaging a volume; and
at least one shaping coil, said at least one shaping coil being positioned relative to said at least one main coil to shape said magnetic field in said volume.
- [c2] 2. The open MRI device of claim 1, further comprising:
a single unit support structure,
wherein said at least one main coil is positioned on an outer surface of said single unit support structure, and
wherein said at least one shaping coil is positioned on an inner surface of said single unit support structure.
- [c3] 3. The open MRI device of claim 2, wherein said single unit support structure comprises:
a substantially cylindrical shell;
a hub positioned along a substantially central axis of said cylindrical shell; and
a plurality of gussets positioned within said cylindrical shell, each of said gussets extending radially outward from said hub.
- [c4] 4. The open MRI device of claim 3, wherein said single unit support structure further comprises:
at least one support post positioned between a first half and a second half of said cylindrical shell.
- [c5] 5. The open MRI device of claim 4, wherein said at least one support post is attached on one end to a flange formed on the first half of said cylindrical shell and attached on an opposite end to a flange formed on the second half of said cylindrical shell.
- [c6] 6. The open MRI device of claim 3, wherein at least one of:
said cylindrical shell, said hub, and said gussets comprise one of stainless steel, aluminum, and fiber-reinforced composites.
- [c7] 7. The open MRI device of claim 2, further comprising:
at least one ferromagnetic ring positioned on an outer surface of said single

unit support structure.

- [c8] 8.The open MRI device of claim 7, wherein said at least one ferromagnetic ring is positioned substantially between coils having opposite current directions to shield interactions between the coils having opposite current directions.
- [c9] 9.The open MRI device of claim 7, wherein said MRI device comprises at least four ferromagnetic rings.
- [c10] 10.The open MRI device of claim 2, further comprising:
at least one bucking coil positioned on an outer surface of said single unit support structure for shielding the magnetic field.
- [c11] 11.The open MRI device of claim 10, wherein said MRI device comprises at least two bucking coils.
- [c12] 12.The open MRI device of claim 1, wherein said MRI device comprises at least eight shaping coils.
- [c13] 13.The open MRI device of claim 1, wherein said at least one shaping coil shapes said magnetic field in said volume to a uniformity of at least 10 ppm.
- [c14] 14.The open MRI device of claim 1, wherein said MRI device comprises an even number of shaping coils.
- [c15] 15.The open MRI device of claim 14, wherein a first half of the number of shaping coils have a first magnetic polarity and a second half of the number of shaping coils have a second magnetic polarity substantially opposite that of said first magnetic polarity.
- [c16] 16.The open MRI device of claim 1, wherein said MRI device comprises a plurality of shaping coils, at least one of said plurality of shaping coils having a magnetic polarity opposite to a magnetic polarity of another of said plurality of shaping coils.
- [c17] 17.A magnetic resonance imaging (MRI) apparatus for imaging a volume, comprising:
at least one main coil configured to generate a magnetic field;

at least one bucking coil configured to shield said at least one main coil; a plurality of shaping coils to shape said magnetic field in said volume; and a plurality of ferromagnetic rings for shielding interactions between coils of opposite polarity, at least one of said plurality of ferromagnetic rings being positioned between said at least one main coil and said at least one bucking coil.

[c18] 18. The MRI apparatus of claim 17, further comprising:
a single unit support structure for supporting said at least one main coil, said at least one bucking coil, said plurality of shaping coils, and said plurality of ferromagnetic rings.

[c19] 19. The MRI apparatus of claim 18, wherein said single unit support structure comprises:
a substantially cylindrical shell;
a hub positioned along a substantially central axis of said cylindrical shell; and
a plurality of gussets positioned within said cylindrical shell, each of said gussets extending radially outward from said hub.

[c20] 20. A magnetic resonance imaging (MRI) apparatus for imaging a volume, comprising:
means for generating a magnetic field for imaging said volume;
means for shielding said means for generating; and
means for shaping said magnetic field.

[c21] 21. The MRI apparatus of claim 20, further comprising:
means for supporting said means for generating, said means for shielding, and said means for shaping.

[c22] 22. The MRI apparatus of claim 20, further comprising:
means for shielding interactions between coils of opposite polarity.